



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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GROUND WATER AND ECOSYSTEMS RESTORATION DIVISION
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OFFICE OF
RESEARCH AND DEVELOPMENT

June 19, 2008

MEMORANDUM

SUBJECT: Review of *Permit-By-Rule In Situ Chemical Reduction Application – Shieldalloy Metallurgical Corporation Site* (08-R02-002)

FROM: Ralph Ludwig, Ph.D.
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TO: Trevor Anderson, RPM
U.S. EPA, Region 2

We have reviewed the document entitled *Permit-By-Rule In Situ Chemical Reduction Application – Shieldalloy Metallurgical Corporation* dated January 2008. We have no issue with the use of ZVI to treat Cr(VI) and TCE at the site. ZVI may not necessarily be the cheapest alternative but may conceivably be the most effective alternative for a longer-term treatment scenario. In our opinion, the subject document is, in general, technically sound and we have only a few minor comments for consideration.

1. The results of the batch studies yielded few surprises since ZVI (regardless of form) is known to be effective in treating Cr(VI) and TCE under a wide range of geochemical conditions. It is concluded, on the basis of batch tests results, that micro-scale and nano-scale ZVI are superior to EZVI for specific application at the site. This may be the case but the batch tests unfortunately provide little insight into issues such as dissemination effectiveness and longevity associated with the different forms of ZVI. EZVI may have advantages that cannot be addressed in batch tests (e.g. limited clumping of iron during dissemination and the added presence of an organic substrate that could add effectiveness and longevity to the treatment). The elimination of EZVI as a candidate for treatment at the site does not appear to be highly defensible.
2. It is not clear whether dissolved metals (including arsenic) will be monitored during and following injection. Reducing conditions often promote mobilization of arsenic and

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heavy metals. Dissolved-phase arsenic and heavy metals should be monitored as part of the pilot study.

3. Treatment in the pilot studies will apparently be evaluated using existing groundwater wells located at specific distances from injection locations. If the screened intervals are large, the data obtained from the wells will represent an average over the large screened interval and will provide little insight into the vertical dissemination effectiveness of the treatment. For example, a low ORP reading in a monitoring well will not confirm that ZVI has been successfully disseminated over the entire vertical column. A low ORP reading may be the result of contributions from a relatively small interval over the well column. Multi-level monitoring wells rather than large screened single monitoring wells should ideally be used to evaluate performance of the injection treatment. Collection of cores (as proposed) will undoubtedly help in the assessment of vertical and lateral dissemination effectiveness but may not necessarily suffice.
4. The number of monitoring wells proposed for use in the pilot study is small presumably because the cost of installing additional monitoring wells at 100+ ft below ground surface at the site is high. More monitoring wells would certainly be helpful. It will need to be recognized that the few monitoring wells proposed for use in the study (particularly if screened over large intervals) may present some significant limitations in the interpretation of the data.
5. Ideally, it would be useful to conduct some solid-phase Cr(VI) analysis on post-treatment core samples to provide supporting evidence that Cr(VI) is indeed being converted to Cr(III).
6. Sterilization details for soil samples tested in the treatability study are lacking in Appendix A (e.g. specific dosages of sodium azide used and autoclave temperatures used). We raise this issue because sterilization of soil samples is normally a task that is not easily accomplished.

If you should have any questions/concerns regarding the comments provided, please do not hesitate to contact Ralph Ludwig at 580-436-8603 (ludwig.ralph@epa.gov) or Chunming Su at 580-436-8638 (su.chunming@epa.gov) .

cc: Linda Fiedler (5203P)
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